NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Aviation Engineering Division
Washington, D.C. 20594

May 1, 2006

MAINTENANCE RECORDS GROUP CHAIRMAN'S FACTUAL REPORT

DCA06MA022

A. ACCIDENT

Location: Philadelphia, Pennsylvania

Date: February 7, 2006

Time: 2359 Eastern Standard Time (EST)

Aircraft: McDonnell Douglas DC8-71, N748UP S/N 45948

B. MAINTENANCE RECORDS GROUP

Chairman: Pocholo Cruz
National Transportation Safety Board
Washington, DC

Member: Terry Smith
Federal Aviation Administration
Louisville, Kentucky

Member: John Billings
Federal Aviation Administration
Louisville, Kentucky

Member: Bob Friend
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Member: Dale Carlson
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Louisville, Kentucky

C. SUMMARY

On February 7, 2006, at 2359 eastern standard time, a Douglas DC-8-71F, N748UP, operated by United Parcel Service Company (UPS) as flight 1307, landed at Philadelphia International Airport (PHL), Philadelphia, Pennsylvania, after the crew reported a cargo smoke indication. The three flight crewmembers were able to evacuate the airplane using the L1 slide. Fire subsequently caused substantial damage to the airplane and numerous cargo containers on board. The three crewmembers received minor injuries. Night visual meteorological conditions prevailed and an instrument flight rules flight plan had been filed for the flight from Hartsfield-Jackson Atlanta International Airport (ATL), Atlanta, Georgia, to PHL. The scheduled cargo flight was conducted under 14 CFR Part 121.

The Maintenance Records Group met at the UPS Corporate Offices, Louisville, Kentucky from February 21, 2006 through February 24, 2006 for the field investigation of the accident.

D. DETAILS OF THE INVESTIGATION

1.0 Air Carrier Certificates

United Parcel Service Company (UPS) is located at 1400 North Hurstbourne Parkway, Louisville, Kentucky 40223. A Part 121 operations certificate number, IPXA097B, was originally issued to UPS by the Federal Aviation Administration's (FAA) Louisville Flight Standards District Office (FSDO), Southern Region on October 10, 1986.

UPS also received a Part 145 Repair Station Certificate (Certificate Number QB4R460M) on April 28, 1982, from the FAA's Louisville FSDO. The repair station, which is located at 8001 Ashbottom Road, Louisville, Kentucky 40213, is approved with Limited - Specialized Services (repair of ULD containers only).

See Attachment 1 for additional details.

2.0 Operations Specifications (OpSpecs)[1]

UPS Certificate IPXA097B, which includes the standards, terms, conditions, and limitations contained in the FAA approved Operations Specifications was reviewed. Some important facts were noted and listed:

(a) Section D072 (Continuous Airworthiness Maintenance Program or CAMP) of the OpSpecs authorized UPS to use the manufacturer/UPS maintenance and engine maintenance programs to maintain the airplanes.

[1] Operations Specifications contains the authorizations, limitations, and certain procedures under which each kind of operation, if applicable, is to be conducted by the certificate holder.

(b) Section D076 of the OpSpecs authorized UPS to use short-term escalations of maintenance intervals on their fleet.

(c) Section D090 of the OpSpecs authorized UPS to utilize CASE[2] as a means of qualifying a vendor for services, parts, and materials to satisfy the requirements of 14 CFR Section 121.373.

(d) Section D091 of the OpSpecs authorized UPS to make arrangement with other organizations to perform substantial maintenance.

(e) Section D097 of the OpSpecs requires UPS to have approved repair assessment guidelines incorporated into the continuous airworthiness maintenance program for its fleet of airplanes.

3.0 Aircraft Information

McDonnell Douglas manufactured the airplane in December 1967. Prior to UPS purchasing the airplane on May 1985, Saturn Airways operated the airplane. In May 1985, Interstate Airlines operated the airplane on behalf of UPS. On July 2, 1988, UPS took possession of the airplane (50,561:32 plane total hours and 16,531 plane total cycles) and has been flying under the UPS banner until the time of the accident. The airplane had 67,675:36 plane total hours and 26,669 plane total cycles at the time of the accident.

Engine Data – General Electric – CFM56 – All engine work was accomplished by GE Strothers, Strothers, Kansas.

Position	Engine S/N	Date of Manufacture	Total Engine Time	Total Engine Cycle	Hours since last ESV*	Cycles since last ESV*	Last ESV*2
1	692901	10/28/87	8,433:01	4,863	222:19	170	4/4/05
2	693149	3/20/82	27,766:49	17,839	5,408:20	3,643	6/2/97
3	693166	6/3/82	31,049:23	17,855	2,718:36	2,026	10/23/00
4	693242	1/25/83	30,488:56	18,921	1,821:21	1,408	5/16/01

* ESV – Engine Shop Visit

See Attachment 2 for additional details.

[2] The Air Carriers section of the Nonprofit Coordinating Agency for Supplier Evaluations (C.A.S.E.) was organized as a means of sharing non-prejudicial supplier quality approval data among the membership airlines. This increases surveillance coverage of suppliers and thereby upgrades their quality programs. It also has an economic impact on each C.A.S.E. member by decreasing the cost of supplier surveillance and making their surveillance programs more effective.

4.0 Maintenance and Inspection Programs

The UPS maintenance program is a cumulative program. All lower-level checks are accomplished during the higher-level maintenance checks. For example, a complete “C2” task (highest level check) would include a “C” check with Structural Inspections, a complete ”B” check, a complete “A” check, a complete “PS” check and a complete “AS-E” check.

The following are summaries of each of the above checks. Further itemized tasks can be seen in the Maintenance Specification Manual.

Arrival Service (AS) – two types AS-N and AS-E. AS-N checks are accomplished during planned ground times greater than two hours but less than six hours. AS-E checks are accomplished during planned ground times greater than six hours.

Periodic Service (PS) – accomplished within nine calendar days after the last PS or higher check was accomplished. The check consists of a walk around to check for obvious damages and verify adequate serviceability of critical systems or components. It takes an estimated 16 man-hours to complete a PS check.

“A” Check - “A” checks are accomplished within 70 calendar days after the last A or higher check was accomplished. It takes an estimated 20 man-hours to accomplish an “A” check.

“B” Check – “B” checks are accomplished within 200 calendar days after the last B or higher check was accomplished. It takes an estimated 400 man-hours to accomplish a “B” check.

“C” Check – “C” checks are accomplished at intervals of 24 calendar months from the last C check completion date. Each check requires operational and functional checks for various aircraft systems and sub-systems. It takes an estimated 38 days (4,150 man-hours) to accomplish a typical “C” check.

Structural Inspection (SI) – consist of structural and systems items that are accomplished at intervals of 24, 48 or 72 calendar months. The 72 calendar month items are packaged with the “C” check. C1 items include “C” check items plus SI items in the nose area and upper fuselage and cabin interior above the cusp. C2 items include “C” check items plus SI items in the empennage, fuselage tail area and the lower fuselage below the cusp. C3 items include “C” check items plus SI items in wings, wing center section and pylons. The 48 calendar month items are scheduled with 2 of the 3 packages. SI items are considered part of the “C” check package they are schedule with.

Engine Maintenance is accomplished using the manufacturer’s engine maintenance program with additional UPS Engineering Orders as necessary.

The following is the history of N748UP that lists the time limitation for inspection and check procedures:

Check	Date of recent Inspection	Location	Total Time	Total Cycles	NOTES
Arrival Service Extended	2/7/06	Atlanta	67,674:18	26,668	
Periodic Service	2/5/06	Detroit	67,671:26	26,666	
A Check	1/16/06	Louisville	67,653:44	26,643	
B Check	11/7/05	Ontario, CA	67,533:13	26,562	
C1 Check	5/3/04	TIMCO	66,820:03	26,005	
C2 Check	3/20/02	TIMCO	65,884:47	25,282	Bridging of New SI Program
C3 Check	3/20/02	TIMCO	65,884:47	25,282	Bridging of New SI Program

UPS maintenance personnel accomplish the Arrival Service, Periodic Service, A checks and B checks for the airline, while heavy checks (C1, C2 and C3) are accomplished by an outside maintenance repair organization.

Component Maintenance Programs

(a) Ceiling Lights

An operational check of the interior ceiling lights are accomplished at a PS, A, B, C1, C2 and C3 checks.

(b) Smoke Detector

An operational check of the smoke detectors is accomplished at a PS, A, B, C1, C2 and C3 checks. A test of the smoke detectors entails placing the smoke detector selector switch in the position corresponding to smoke detector being tested. Pressing and holding cargo smoke detector light and checking that light illuminates within 3 seconds maximum. When light is released check that light should extinguish within 5 seconds maximum. Security and installation of the smoke detectors are also accomplished during certain checks.

5.0 Continued Analysis And Surveillance System (CASS)[3]

To comply with requirements of FAR Section 121.37, UPS uses CASS, which is a systems approach to assess the effectiveness of the UPS Aircraft Maintenance organization. CASS has two primary job functions:

(a) The "performance analysis function" includes daily and long-term monitoring, and emergency response related to the performance of affected airplane systems, including airplane engines and components. This function includes, but is not limited to, the monitoring of:

(1) Mechanical problems for affected airplanes. (daily and long-term monitoring)
(2) Deferred Maintenance Items, including repetitive items. (daily and long-term monitoring)
(3) Pilot Reports. (long-term monitoring)
(4) Mechanical Interruption Summary Reports (MIS). (long-term monitoring)
(5) Critical failures. (emergency response)

(b) The "audit function" provides for continuous surveillance of the UPS maintenance operation, including the maintenance departments, UPS gateways, substantial maintenance vendors, and component vendors for compliance with the UPS General Maintenance Manual, FARs, manufacturer's manuals, and other approved manuals that affect UPS maintenance operations. This function includes, but is not limited to, the auditing of:

(1) Accuracy, completeness, currency, and adherence to required records, manuals, and publications.
(2) Procedures for performance of maintenance, turnover/carryover items, deferred maintenance, required inspection, and airworthiness release execution.
(3) Requirements for training programs.
(4) Vendors for proper authorization, qualification, training, staffing, and equipment to perform their contracted functions.

Quarterly CASS reports were reviewed for 2005 with no significant issues noted.

[3] As established by 14 CFR Part 121.373, each certificate holder shall establish and maintain a system for the continuing analysis and surveillance of the performance and effectiveness of its inspection program and the program covering other maintenance, preventative maintenance and alterations and for the correction of any deficiency in those programs, regardless of whether those programs are carried out by the certificate holder or by another person.

6.0 Minimum Equipment List (MEL)[4]

UPS has an approved MEL for the airplane. At the time of the accident, the airplane had one open MEL item (M313704) for the upper cargo deck lights inducing voltage into the smoke detector circuit; circuit breakers B1-746 and B1-491 were pulled and collared.

See Attachment 3 and 6 for additional details.

7.0 Supplemental Type Certificates (STC)[5]

Supplemental Type Certificates (STC), supplied by UPS were reviewed. The last STC that was accomplished on the airplane was the installation of a global positioning system monitoring unit per STC ST01079AT and EO DC8-3410-21462-B on June 24, 2005. No issues were found with this installation.

In addition, a review of maintenance records did not reveal any paperwork of when the airplane was converted from a passenger configuration airplane to a cargo configuration airplane, however the records show the airplane was built as a passenger/cargo combi by Douglas. When UPS took possession of the airplane in 1985 the airplane was in a cargo configuration.

8.0 Airworthiness Directive (AD)[6] and Service Bulletin (SB) Summary

UPS provided an AD summary listing for the airplane for review. No discrepancies were noted in the listings. The following are of note:

AD 2001-08-16: Wood Electric Circuit Breaker Replacement: This AD required a one-time inspection to determine the manufacturer of the circuit breakers in DC8 airplanes. The AD was intended to prevent internal overheating and arcing of the circuit breaker and airplane wiring due to long-term use and breakdown of internal components of the circuit breakers which could result in smoke and fire in the flight compartment and main cabin. UPS complied with this AD on March 20, 2002.

AD 2001-08-18: Insulation of Lighting Switches in the Cabin Service Panels. The AD requires the installation of heat shrinkable tubing or application of Peel-Kote on each terminal connection of all cabin lighting switches in the forward and aft cabin electrical service panels. The AD was issued to prevent a short circuit within the cabin electrical service panel due to a foreign object being

[4] The FAA approved Minimum Equipment List contains a list of equipment and instruments that may be inoperative on a specific aircraft for continuing flight beyond a terminal point.
[5] The FAA issues Supplement Type Certificates, which authorize a major change or alteration to an aircraft, engine or component that has been built under an approved Type Certificate.
[6] Airworthiness Directive (AD) is a regulatory notice sent out by the FAA informing the operator of an action that must be taken for the aircraft to maintain its airworthiness status.

lodged between the terminals of a cabin light switch. Such a short could result in the overheating and damage to light circuits, and consequent smoke and fire in the main cabin of the airplane. UPS complied with this AD on July 2, 2001.

Service Bulletins were complied with as necessary to the airplane and were sometimes addressed within the Engineering Orders and AD's.

9.0 Engineering Orders (EO)

Engineering Orders developed by previous operators and UPS were reviewed by the Maintenance Records Group. The following are of note:

(a) Smoke Detector

(1) EO-DC8-2610-13006-A, DC8 Fire Detection-Replacement of Wireless Smoke Detector Units P/N 100-0649-01 with P/N 100-0649-01MOD2, complied with on January 27, 2001.

(2) DC Service Bulletin 26-28, Fire Protection – Detection – Install Additional Main Cabin Smoke Detector, Operator ST, Factory Serial No. 45948 and 45949. A review of the maintenance records could not determine a date for when the Service Bulletin was complied with.

(b) Cargo Lighting

(1) EO-DC8-3320-14654-A, DC8: Insulation of Light Switches in the Cabin Service Panels, Service Bulletin DC8-33A053, complied with on June 2, 2001.

(2) EO-33-0-1191-T1, Service Bulletin 33-56, Revise Wiring Circuit for Aft Entrance Lights, complied with date April 28, 1977.

(3) EO-33-0-1221-T1, Replace Passenger Compartment Dome Light Fixture, Service Bulletin 33-46, complied with on April 28, 1977.

(4) EO DC8-3330-5021-A Cargo Light Assembly Fabrication Authorization. A review of the EO revealed that the Light Assembly is not marked in accordance with UPS GMM Part Identification procedure 5-10-1(A)(3) with a "U" to identify that part was fabricated per UPS supplied drawings or EOs.

10.0 Airplane Technical Logs

The Airplane Technical Logs contain information regarding the airplane's maintenance and maintenance checks. The technical logs were reviewed from January 15, 2006 through February 8, 2006. The following are items of note from the technical logs and flight release of airplane N748UP from ATL-PHL on February 8, 2006:

(a) M313704 - MEL 33-3-1 Main Cargo Deck lighting has several lights INOP with circuit breakers collared.

(b) D289368 - Temporary hydraulic flex line installed in nose gear system return line (E/E compartment).

(c) D312492 - Right hand fuselage and door skin dent damage at Pit# 32 door.

(d) I268188 – Right hand flap has lower skin damage.

See Attachment 4 for additional details.

11.0 Weight and Balance Summary

Per UPS Weight and Balance Control Manual, all UPS airplanes will be reweighed according to the Fleet Weighing Program as outlined in AC120-27D. Only a portion of each fleet must be weighed in a 36 calendar month period. The unaccounted weight and moment change determined by this sample will be applied to the remainder of the fleet at the end of the 36-month weighing cycle. Regardless of the number of aircraft in the fleet, no aircraft may exceed 18 years (six 36-month weighing cycles) from the date of its last weighing before being reweighed.

The last weight and balance for N748UP was performed on April 30, 2004 and was accomplished by TIMCO, Greensboro, North Carolina.

Weight and Balance Summary:

Basic Operating Weight:	152,690 pounds
Arm:	836.5 inches
Moment:	127,721,913

See Attachment 5 for additional details.

12.0 Service Difficulty Reports (SDR)[7]

SDR's from January 1, 2005 through February 8, 2006 were reviewed. UPS had one SDR (February 9, 2005) for this airplane. The discrepancies noted that the crew lost the #2 INS with a warning light, smelled electrical fumes from the pedestal and turned off the #2 INS. The crew noticed the pitch trim compensator was not fully retracted and had 3/8 extension showing. The crew followed procedures for the pitch trim compensator not fully retracted and declared an emergency with Tulsa. Maintenance removed and replaced the pitch trim compensator actuator and tested per MM 27-30-07. Operations check of the system was good on the ground.

A review of FAA's SDR database for the DC-8 did not reveal chronic issues with the fleet.

13.0 Major Repairs and Alterations

The Maintenance Records Group reviewed the Major Repairs and Alterations list provided by UPS. The last major repair and alteration on airplane was accomplished on March 27, 2005 by UPS and consisted of the activation of the GPS system for the INS and EGPWS position updating.

14.0 Vendors

The Maintenance Records Group reviewed the Approved Vendor List provided by UPS. UPS accomplishes audits of the approved vendors on a biennial basis or on a more frequent scheduled based on findings. As previously stated, UPS is authorized to use Coordinating Agencies for Suppliers Evaluation (CASE)[8].

15.0 Method of Record Keeping

The UPS Aircraft Records Department in Louisville, Kentucky maintains pertinent aircraft, engine, and component records using both manual and electronic methods. The Aircraft Records Management System (ARMS) is an optical imaging system that provides storage, indexing, and retrieval of exact digital images of aircraft maintenance documents. The images once scanned, indexed, and audited are written to an optical disk and are unalterable. Index values are stored in an Oracle database, which is backed up to tape each night.

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[7] A Service Difficulty Report (SDR) is a report of the occurrence or detection of each failure, malfunction, or defect as required by 14 CFR 121.703.

[8] The Air Carriers section of the Nonprofit Coordinating Agency for Supplier Evaluations (C.A.S.E.) was organized as a means of sharing non-prejudicial supplier quality approval data among the membership airlines. This increases surveillance coverage of suppliers and thereby upgrades their quality programs. It also has an economic impact on each C.A.S.E. member by decreasing the cost of supplier surveillance and making their surveillance programs more effective.

Duplicate optical disks and database tapes are stored off site for disaster recovery purposes.

16.0 Manuals

The following are a list of manuals the air carrier uses to maintain their aircraft:

(a) Aircraft Reliability Program Manual – This manual describes the UPS Aircraft Reliability Program, its operation, ambitions, and authority to function as an effective system to identify and establish proper maintenance processes.

(b) General Maintenance Manual (GMM) – This manual describes the duties and responsibilities of the maintenance department and provides a detailed description of the general maintenance policies and procedures.

(c) Ground Operations Manual (GOM) – This manual provides information and instructions for the ground handling of UPS operated aircraft.

(d) Illustrated Parts Catalog (IPC) – The IPC is intended for use in provisioning, requisitioning, storing, and issuing replaceable aircraft/engine parts and units, and identifying these parts. It is also used to list and illustrate assemblies and detailed parts, which are utilized for the aircraft/engines operated by UPS. The part number content of the IPC arrangement and breakdown sequence of items is compatible with Air Transport Association (ATA) No. 100.

(e) Maintenance Manuals (MM) – The Maintenance Manual contains the information necessary to service, troubleshoot, functionally check, repair and/or replace components installed on the aircraft/engines operated by UPS. The manual identifies limits and tests for the associated components or systems.

(f) Minimum Equipment List, Configuration Deviation List, and Dispatch Deviation Procedures - This manual provides information pertaining to the dispatch of aircraft with inoperative system(s)/configuration deviation and also references maintenance procedures relating to inoperative MEL items.

(g) Overhaul Manual (OHM) – Provides technical data required to overhaul the various components installed on the aircraft. This data contains descriptive, disassembly, cleaning, check, repair, assembly, functional test, special tools, and illustrated parts information. The Overhaul Manual does not contain information relative to work normally performed on the flight line or in the aircraft maintenance operation.

(h) Structural Repair Manual (SRM) – This manual contains material identifications for structure, subject to repairs generally applicable to structural components of the aircraft that are most likely to be damaged. Structural damage criteria fastener installation and procedures that must be performed concurrently with structural repair are identified.

(i) Wiring Diagram Manual (WDM) – The WDM Manual contains combined electrical and electronic wiring diagrams and schematics, an electrical and electronics list, and electrical and electronic charts. The equipment list, contained within the WDM, is an approved source for obtaining correct part numbers for aircraft, engines or components.

17.0 Maintenance Issue (Deferral of Ceiling Lights)

At the time of the accident, the main deck cargo compartment lighting was deferred (M313704) per UPS MEL 33-3-1. Troubleshooting by UPS Maintenance, Tech Services and Liaison Engineering revealed the main deck lighting system was inducing an AC voltage electromagnetically into the 28 volt DC smoke detection circuit. The main deck smoke detection system was tested by the timing of the press to test light on the Flight Engineers panel and determining if the test light extinguishes within five seconds as described in DC-8 Aircraft Maintenance Manual 26-10-07-02.

With the main deck lighting on, the press to test light would take up to ten seconds to extinguish for several smoke detectors. Further troubleshooting revealed that when certain main deck cargo compartment lighting circuit breakers were pulled and collared (B1-746 and B1-491), the main deck smoke detection system test would work properly per the maintenance manual.

A plan to either separate the wiring or replace some of the unshielded wire with shielded wires was being developed by UPS Engineering and was to be accomplished at the airplane's next heavy maintenance visit.

See Attachment 6 for additional details.

18.0 Component Issues

Escape Ropes:

Per Douglas Drawing 4713946 the ropes are manufactured to a length of 132 inches. The current maintenance for the escape rope and attaching hardware are as follows:

(a) DC-8 PS check (TC0050), "A" check (TC0100), and "B" check (TC0231) perform a check of escape tapes (condition). Per DC-8 Aircraft

Maintenance Manual 25-60-02-2 lists the procedures for packing, inspecting and packing the tapes. They are as follows:

(1) Remove escape tape container cover.
(2) Coil escape tape as tight as possible and place into container.
(3) Install escape tape container cover.

UPS has not been able to find the actual copy of the Task Card that was signed off for the PS check on February 5, 2006.

(b) DC-8 "C" check (TC4032) performs a general visual inspection of the cockpit interior including applicable installations for condition, obviously missing parts, damage and cleanliness. This task was last accomplished on April 2, 2004 with no discrepancies.

(c) DC-8 "C1" check (TC5018) and "C2", "C3" check (TC5002) perform an inspection of the escape strap at the forward entry door for condition and stowage (if installed). This task was last accomplished on April 30, 2004 with no discrepancies.

Main Cargo Door T-Handle:

The maintenance program on the main cargo door hydraulic control valve and T-handle are checked during the PS checks. In addition, "C" check (TC5004) inspects the following:

(a) Control valve and actuating shaft to verify that the shaft moves freely into down/neutral lock position.

(b) Control panel access door closure studs and catch for condition.

(c) Perform an inspection check for the integrity of the valve universal joint T-handle attachments and inspects roll pins for looseness and wear.

TC5004 was last accomplished on April 29, 2004 with no discrepancies to the T-handle.

A check of the isolation switch and placards in the area of the MCD T-handle on the floor is also inspected per "C" check (TC5004). The inspections are as follows:

(a) The condition of the cargo door isolation valve switch guard (if installed).

(b) The condition and security of attachment for the isolation valve switch guard strike plate, which is attached to control panel access door (if installed).

There are no specific tasks in the current DC-8 maintenance program that checks the T-handle area placards.

Smoke Curtain Maintenance:

A review of the DC8 maintenance manual and SRM for main deck cargo smoke curtain removal, installation and repairs along with maintenance program was conducted.

(a) DC8-2550-1872-A & -B Standard Line Maintenance (LM) Repairs for Torn/Ripped DC Smoke Curtains, EO issued on May 6, 1994.

(b) DC8-2550-11948-C, DC-8-Rework-Smoke Barrier, EO issued on May 02, 2001.

(c) DC8-2550-1873-C, Standard Line Maintenance (LM) Repair for Loose Velcro on DC8 Smoke Curtains, EO issued on November 10, 1995.

(d) DC-2550-11666-B, Alternate Material for the DC8 Smoke Curtain P/N 5891931-181, EO issued on September 5, 2002. A review of the two maintenance record logbooks on board the airplane indicated no recent repairs to the smoke curtains.

Pocholo Cruz
Maintenance Records Group Chairman